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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/509,338	10/08/2004	Takehiro Ueda	260055US2SPPCT	2024
22850	7590	06/15/2006	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			DAHIMENE, MAHMOUD	
			ART UNIT	PAPER NUMBER
			1765	

DATE MAILED: 06/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/509,338

Applicant(s)

UEDA ET AL.

Examiner

Mahmoud Dahimene

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 08 October 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 10/8/04, 2/15/05
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 9-12, 20-26 are rejected under 35 U.S.C. 102(b) as being anticipated by Flanigan et al. (US 6,081,414).

Regarding claims 1, 12, the reference of Flanigan et al. (US 6,081,414) describes an apparatus for improved biasing and retaining a workpiece in a plasma process chamber comprising an electrostatic chuck-pedestal (block) (figure 2) having a flow path of a heat medium in an inner part (236 and 220), a component (105) in the vacuum processing chamber disposed to be in contact with the block and made at least partly of an insulative material. The pedestal temperature is controlled by circulating an insulative fluid (coolant) (column 2, line 44) as the heat medium in the flow path (236). The wafer is transferred to/from the chamber from/to a loadlock (figure 1) the wafer is plasma processed. The coolant is continuously circulating even during wafer transfer when no plasma is generated in order to maintain chuck temperature during wafer transfer. The vacuum in the chamber is controlled for PVD or other processes. Flanigan

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cites "In operation, a wafer (102) is placed on the support surface (103) of the electrostatic chuck (105). Air is drawn out of the chamber (100) via a vacuum pump (128) to create a low pressure environment (i.e. 1 mTorr to 5 Torr). A reactant gas, preferably Argon (argon is an inert gas), is introduced into the chamber (100) from one of the remote gas sources" (column 7, line 19), pressure is controlled during Argon flow.

As to claims 9, 10, 11, 20, 21, 22, in PVD or any other plasma process the pressure in the process chamber is controlled by a computer system which inherently operates with a predetermined sampling rate for measuring and regulating the pressure which makes the controlling process intermittent. When the control loop is initiated, the pressure is controlled even when flow rates are varied or fixed.

As to claims 23, 25, The pedestal (block) of Flanigan is made of a conductive material (234 and 106).

As to claims 24, 26, the apparatus of Flanigan remains inherently in idle when no wafer is loaded into the chamber or when charging of the component in the vacuum processing chamber is suppressed.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 2, 7, 13, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Flanigan et al. (US 6,081,414) as applied to claims 1, 9-12, 20-26 above, and further in view of Watanabe et al. (US 5,625,526).

Regarding claims 2, 13, it is noted that Flanigan is silent about a fluorinated refrigerant.

The reference of Watanabe describes an electrostatic chuck system wherein a fluorinated refrigerants such as (R-22) are conventionally used as a cooling medium (column 23, line 36).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Flanigan to include a fluorinated refrigerants such as (R-22) for cooling the pedestal because Watanabe teaches those refrigerants are conventionally used for wafer cooling. One of ordinary skill in the art would have been motivated to use a fluorinated refrigerant when processing requires low wafer temperature..

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As to claims 7, 18, it is noted that Flanigan is silent about nitrogen gas.

The reference of Watanabe teaches "Both the plasma generating operation and the process gas supplying operation are stopped after completed plasma etching. In addition, a nitrogen gas is introduced into the process chamber 504 to replace the process gas and reaction products, and the process chamber 504 is evacuated" (column 21, line 25).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Flanigan to include nitrogen as the purging gas because Watanabe teaches nitrogen is conventionally used for purging chambers. One of ordinary skill in the art would have been motivated to used nitrogen as the purging gas because of the low financial and environment cost associated with the production and use of nitrogen.

### ***Claim Rejections - 35 USC § 103***

6. Claims 3-5, 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Flanigan et al. (US 6,081,414) as applied to claims 1, 9-12, 20-26 above, and further in view of Nagasaki (US 6,215,643).

Regarding claims 3, 4, 5, 14, 15, 16, it is noted that Flanigan is silent about the volume resistivity of the ceramic.

The reference of Nagasaki describes a ceramic electrostatic chuck, with an aluminum base (11), system and discloses to establish the Johnson-Rahbeck effect, a ceramic portion present between an electrode and an attractive surface of an

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electrostatic chuck needs to have a volume resistivity of not lower than  $10^9 \Omega\text{-cm}$  and lower than  $10^{11} \Omega\text{-cm}$  in a process temperature range. (column 1, line 45).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Flanigan to include ceramic as an insulative material with volume resistivity  $10^9 \Omega\text{-cm}$  or higher positioned on an aluminum base because Nagasaki teaches the resistivity range of  $10^9 \Omega\text{-cm}$  to  $10^{11} \Omega\text{-cm}$  are conventional for electrostatic chucks. Overlapping ranges are held obvious.

### ***Claim Rejections - 35 USC § 103***

Claims 6, 8, 17, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Flanigan et al. (US 6,081,414) in view of Nagasaki (US 6,215,643) as applied to claims 3-5, 14-16 above, and further in view of Paschen (from F. Paschen published paper (Wied. Ann., 37, 69, 1889) see attached page).

Regarding claims 6, 8, 17, 19, It is noted Flanigan is silent about setting a pressure range for a given gap distance between electrodes in the chamber based on the Paschen curve for a given gas including nitrogen.

In general Paschen curves for different gases indicate voltage breakdown of the gas as a function of pressure (and gap distance) as shown in the attached figure from the reference of Paschen.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Flanigan to include the teachings of Paschen which indicate, that for a given gas and gap distance, ignition of a plasma

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has a minimum voltage, the pressure region around this minimum require a voltage only slightly higher than the minimum breakdown voltage. One of ordinary skill in the art would know that striking the plasma at a minimum voltage is desirable for minimizing potential damage on the wafer or to the equipment, and therefor would chose and operating pressure neighboring the minimum breakdown voltage, but not very far from it otherwise the breakdown voltage under such conditions would be too high for plasma ignition. Applicant has not shown any unexpected results in selecting a pressure not lower than 0.6 times nor higher than 2.0 times the pressure yielding the lowest breakdown voltage (or 13 Pa to 40 Pa for the case of nitrogen gas), any pressure near the minimum value would have yielded similar results for a given gas.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mahmoud Dahimene whose telephone number is (571) 272-2410. The examiner can normally be reached on week days from 8:00 AM. to 5:00 PM..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
MD

**NADINE G. NORTON**  
**SUPERVISORY PATENT EXAMINER**

